Columbia River Treaty

IN THE BEGINNING…

Prior to 1909, U.S.-Canada joint water issues were resolved on a case by-case basis. The 1909 Boundary Waters Treaty set out rules for dispute resolution between the U.S. and Canada, and created the International Joint Commission (IJC) to resolve issues – signed by the U.S. and Great Britain.

Western watersheds were relatively ignored until the 1930's, when development on the Columbia main stem began

Toward the end of WWII the federal governments directed the IJC to start looking at development of the Columbia Basin for power and flood control, but relatively little in the way of studies was actually done, until

Memorial Day flood of 1948, with over 50 deaths and destruction of Oregon's 2nd largest city and >$100 million damages in Canada and U.S., triggered new studies focused on flood control, and power.


FLOOD CRUMBLES VANPORT, HEAVY DEATH TOLL FEARED

The Oregonian

Lake Dike Gives Way, 18,500 Made Homeless, Scores Reported Hurt

Men Struggle for Lives as Flood Waters Engulf Great Housing Project

WHY DID THE GOVERNMENTS WANT A TREATY?

- **Flood of 1948 required more Flood Control**
- **Canada has 15% of basin area, but 30% of 190 million acre feet (Maf) average annual flow @ The Dalles**
- **50% of worst Columbia flood (1894) flow came from Canada**
- **Flow at US/Canada border ranges from 14,000 to 555,000 cfs**
- **Optimize US operations to realize the benefits of the Canadian storage**

HOW DID WE GET THE TREATY?

1959, IJC report with alternative plans and principles for apportioning the downstream benefits

-Negotiations between February 1960 and January 1961 led to Prime Minister Diefenbaker and President Eisenhower signing the Columbia River Treaty on January 17, 1961. With strong support from the PNW, the Treaty was ratified by the U.S. Senate on 3/16/61.

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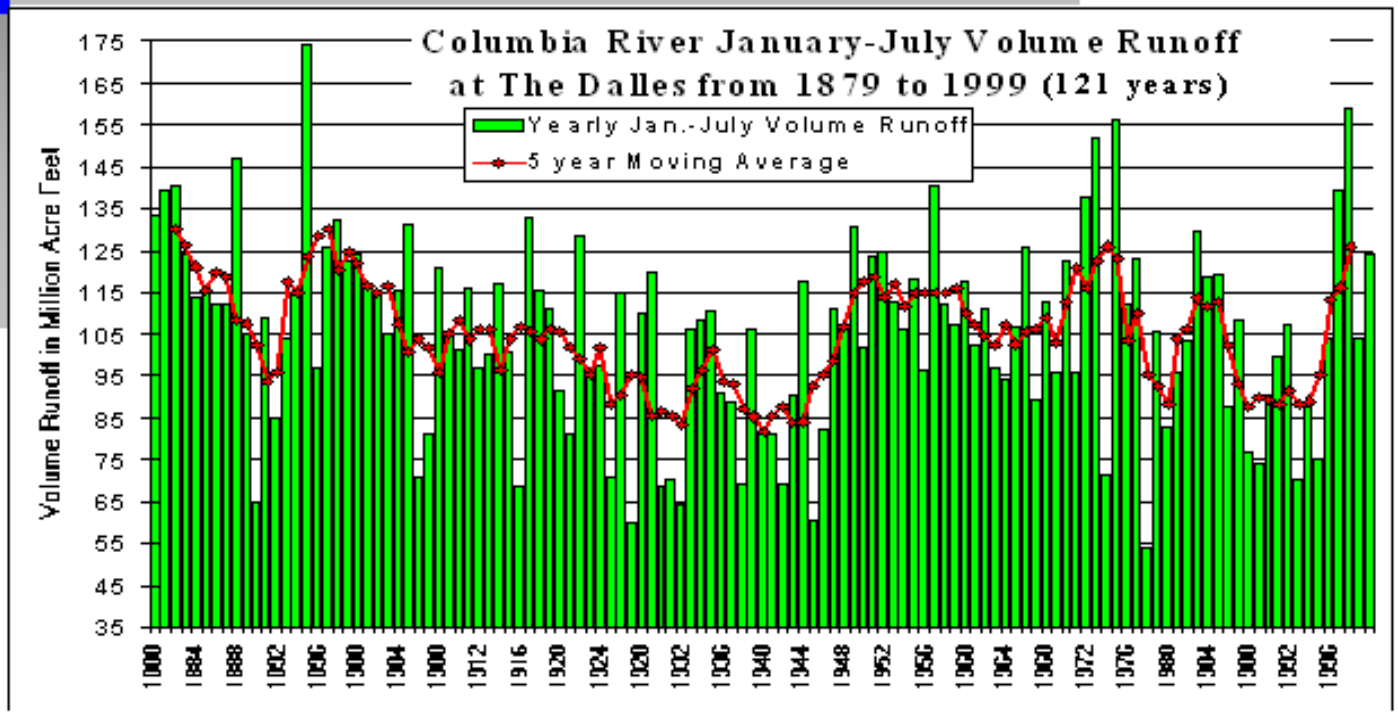
The Canadians were not ready to go forward. BC government wanted to sell the downstream power benefits to US utilities to build dams on Columbia and Peace rivers; but the federal government was opposed.

Year to Year Variation in Flow About +/- 50% of Average



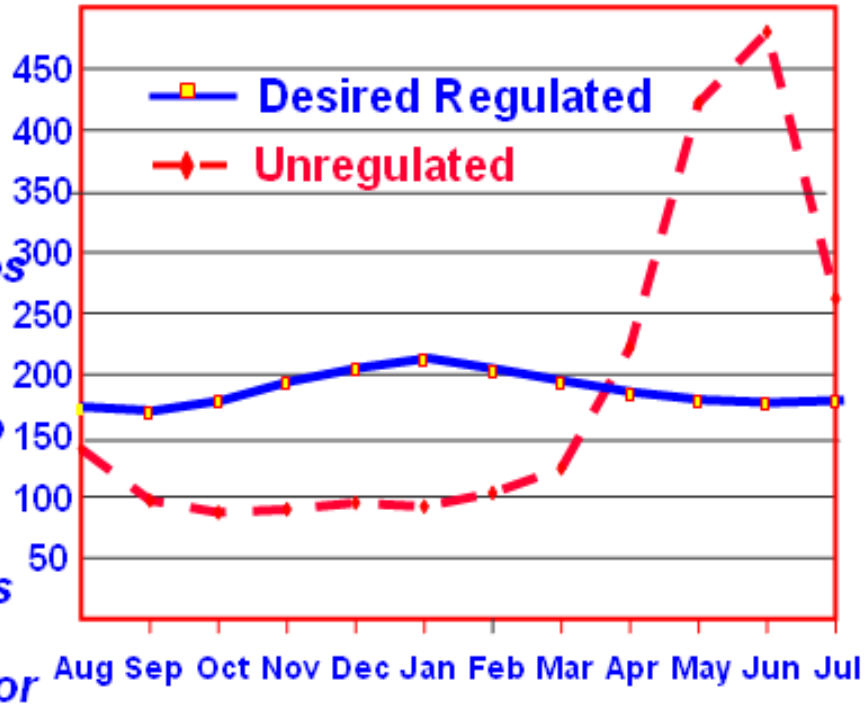
Minimum = 53.5 maf, Average = 105.6 maf, Maximum = 173.8 maf

Long-term trends are apparent over time, but year to year variations are almost random, with no reliable next year forecast.

Large Seasonal Variation in Flow

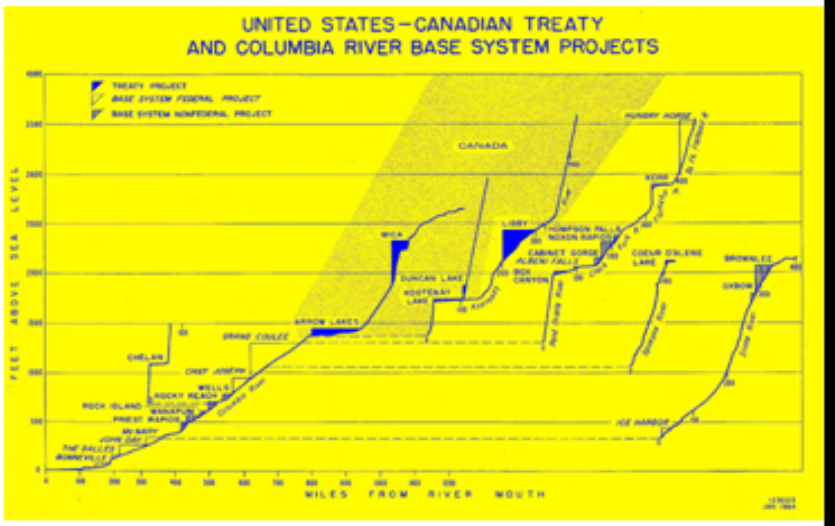
Comparison of 50-year Average Monthly Unregulated Flow to Desired Regulated Flow at The Dalles in Kcfs

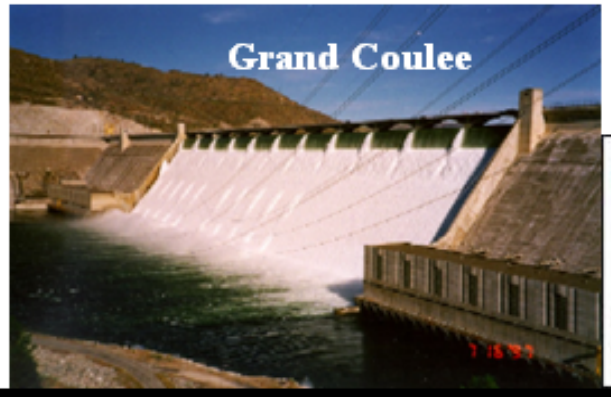
- *Unregulated flow at The Dalles varies from 36,000 to 1,240,000 cfs a 1:34 ratio, compared to the St. Lawrence 1:2 & Mississippi 1:25 ratios*
- *Reservoir storage converts spill, nonfirm, and unusable energy to firm energy and usable nonfirm energy.*
- *Seasonal flow forecasts are poor. The 95% probability forecast error for the January forecast of the Jan-July volume runoff at The Dalles is +/- 27 maf.*



Columbia is the most powerful river in North America

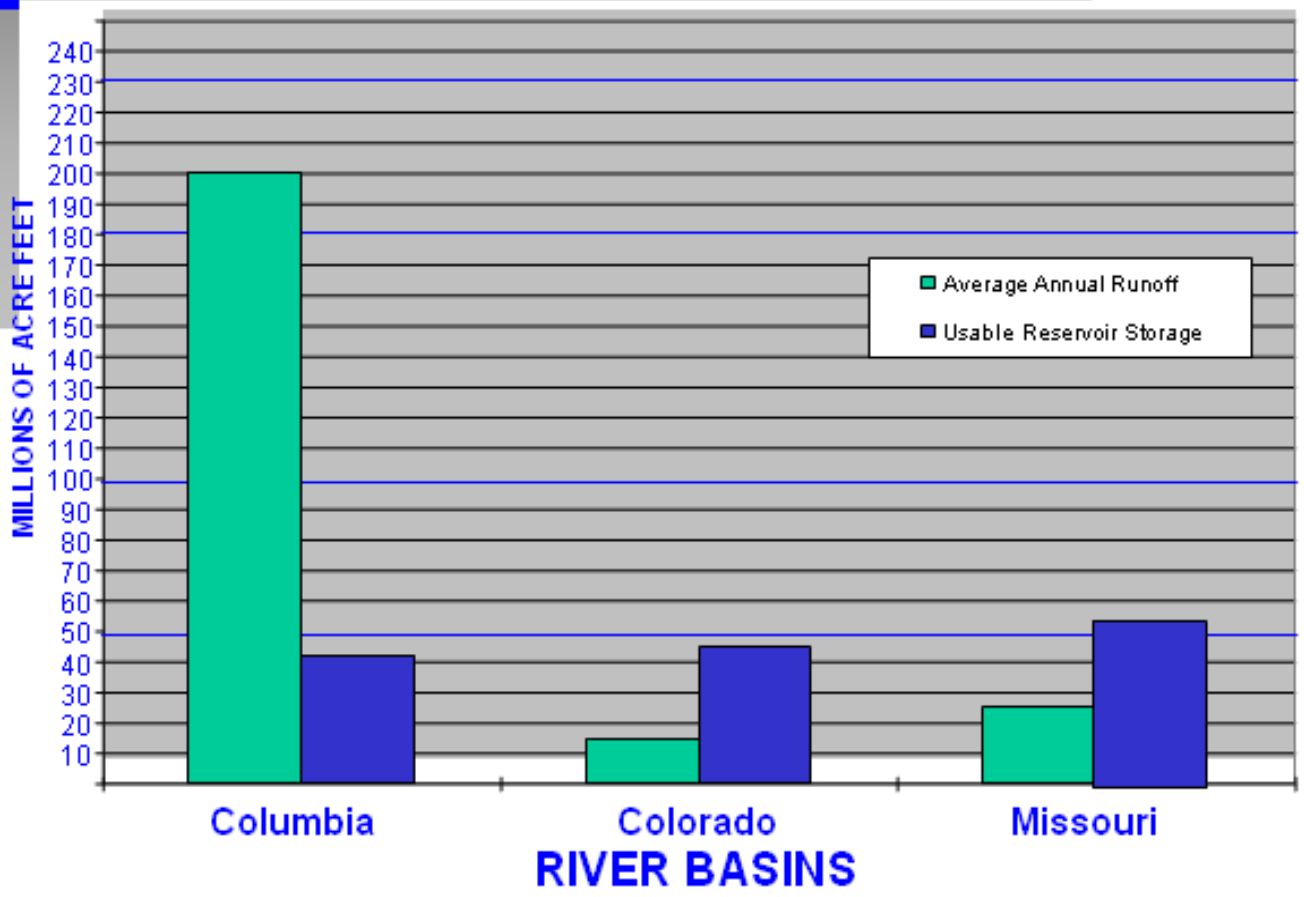
- Hydropower is measured by river flow times change in elevation (called "head")
- St. Lawrence and Mississippi have more flow, but much less head
- Grand Coulee has twice the head of Niagara Falls





Niagara Falls & Powerhouse

Average Annual Runoff And Usable Reservoir Storage Major Western River Basins



FINAL NEGOTIATIONS

Detailed joint Canadian/U.S. engineering studies during 1962-1963 estimated long term power benefits for a future sale.

Negotiations between the governments led to a Treaty Protocol, signed January 22, 1964, clarifying some Treaty provisions, and a Canada/B.C. Agreement that allowed the sale of the Canadian Entitlement to the U.S.

Negotiations between Canada, British Columbia, United States government, and mid-Columbia utilities led to an agreement on a 30-year sale of the Canadian Entitlement to Columbia Power Storage Exchange, a consortium of U.S. utilities.

Exchange of diplomatic notes implementing the Treaty and the Entitlement sale were completed on Sept. 16, 1964.

<--LBJ signs Treaty Proclamation at Peace Arch

Canadian Foreign Minister Paul Martin visits US Entity - Chuck Luce & General Lapsley --->

WHAT DID WE GET?

Hydropower:

15.5 maf of Can. Stor. for opt. MW gen. in U.S. and Canada.

Power benefits: dependable capacity and average annual usable energy. Canada receives 1/2 of the increased power generated d/s in the U.S. due to the operation of Canadian Treaty Storage. Actual operation and magnitude of water year DO NOT affect d/s power benefits.

D/s power benefits from Libby operation remain in the country where they are generated. Operating plans provide a monthly reservoir balance relationship for the whole of Canadian storage, allowing Canada the flexibility to operate individual projects for maximum Canadian benefit.

WHAT DOES THE TREATY DO?

The Treaty required Canada to construct and operate 15.5 Maf of reservoir storage in the upper Columbia River basin at Mica, Arrow, and Duncan for optimum power generation and flood control downstream in Canada and the U.S.

U.S. paid Canada $64.4 million for one-half of the estimated future U.S. flood damages prevented through 2024, and must deliver to Canada annually one-half the estimated downstream power benefits generated at U.S. dams.

The Treaty allowed the U.S. to construct and operate the Libby project with 5 Maf storage on the Kootenai River in Montana for flood control and other purposes. Canadian agreement was required because the project floods back across the border into Canada. No benefits are paid for Libby, but the project is obligated to coordinate with Canadian projects.

TREATY TERMS

The Treaty has no end date. Either government has the option to cancel the Treaty after 60 years (2024) with a minimum of 10 years advance notice. With termination:

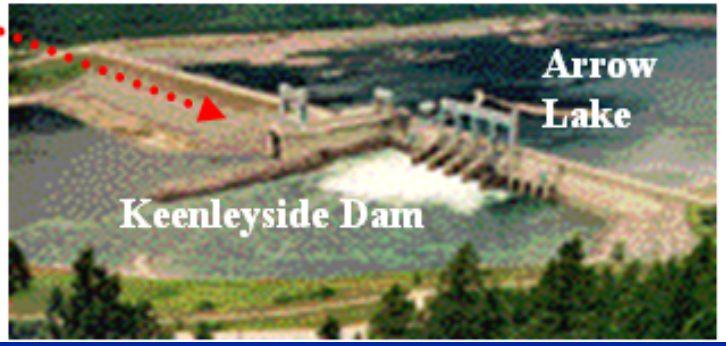
• Mica, Duncan, Arrow, and Libby may continue to operate subject to the 1909 Boundary Waters Treaty

• Canada must provide flood control operation for the U.S. as long as need exists and projects exist, but US must pay Canada's operating costs and power losses. The FC form after 2024 is revised to Called Upon, not annual planned FC operation. The US needs to use their FC first, and call upon Canada only when needed.

• Canada may continue any Kootenay Diversions

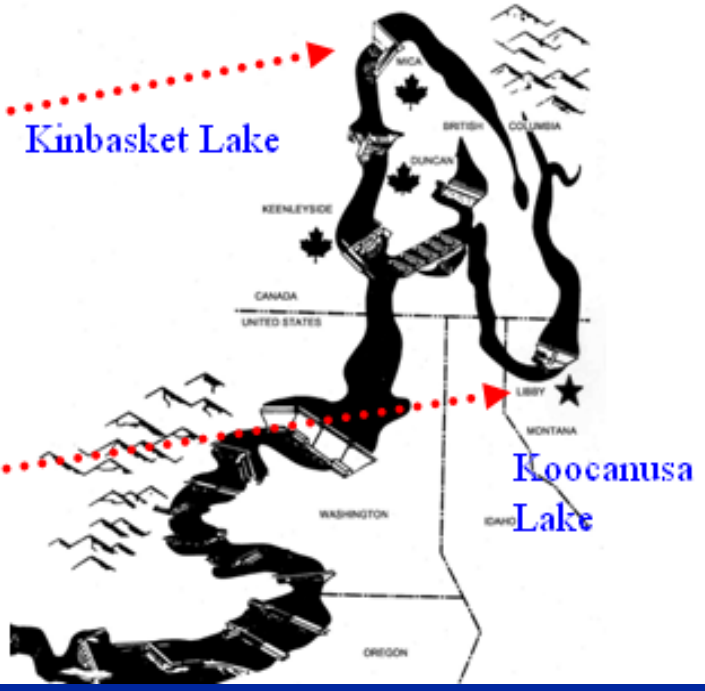
Duncan and Arrow

	Completed	Treaty Storage	Non-Treaty Storage	Generator Capacity	Dam Height
DUNCAN	1967	1.4 Maf	None	None	130 ft.
ARROW	1968	7.1 Maf	.25 Maf	170 MW	170 ft.



Mica and Libby

	Completed	Treaty Storage	Non-Treaty Storage	Installed Capacity	Hydraulic Capacity	Dam Height
MICA	1973	7.0 Maf	5.0 Maf	1740 MW	40 KCFS	650 ft.
LIBBY	1973	5.0 Maf	None	604 MW	25 KCFS	370 ft.



MORE DETAILS

The Treaty is designed primarily to achieve hydropower and flood control benefits, and not for other purposes such as providing water for irrigation, navigation, recreation, or flows to assist fishery habitat or migration.

The Treaty preamble states:

- "Being desirous of achieving the development of those resources in a manner that will make the **largest contribution to the economic progress** of both countries and to the welfare of their peoples of which those resources are capable, and
- Recognizing that the greatest benefit to each country can be secured by cooperative measures for **hydroelectric power generation and flood control,** which will make possible other benefits as well. Have agreed as follows:"

Treaty Article III states:

- "The USA shall maintain and operate the hydroelectric facilities included in the base system and any additional hydroelectric facilities constructed on the main stem of the Columbia River in the United States of America in a manner that **makes the most effective use of the improvement in stream flow** resulting from operation of the Canadian storage **for hydroelectric power generation** in the United States of America power system."

This obligation is discharged by reflecting this assumption in the default Treaty storage operating plans and downstream power benefit calculation.

DOWNSTREAM POWER BENEFITS

Based on the 1961 U.S. (Base) hydro system. The 1961 Base system is used to preserve the CAN 1st added status (which slows the reduction of the CAN Entitlement over time).

The Canadian Entitlement = 1/2 of d/s power benefits
= Difference of the U.S. Base System, with and without the addition of Treaty storage

Canadian Entitlement=

- **Energy: 1/2 of the change in average annual energy**
- **Capacity: 1/2 of the change in dependable capacity**

Actual operations DO NOT affect the Entitlement

OTHER CONSIDERATIONS

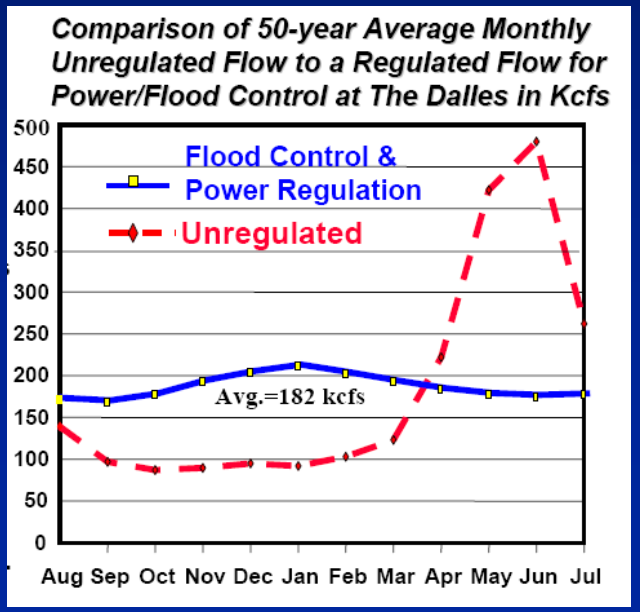
Columbia has large seasonal and annual variation in flow, and little storage compared to other basins.

Year to year variation in average annual unregulated flow are unpredictable, and vary up to +46% to -41% from the mean at The Dalles.

Within year seasonal flow forecasts are a little better. The 95% confidence forecast error for the January forecast of the Jan.-July volume runoff at The Dalles is +/- 26 %.

Total Columbia storage prior to Treaty about 13 Maf, today it's about 55 Maf or 41% of annual flow. Missouri and Colorado have 2-3 times more storage than annual average flow!

Canadian Treaty storage reduces flood flows, reduces spill, and shifts energy from low value time periods to high value time periods.



NON-TREATY STORAGE

In addition to the 15.5 maf of Treaty storage, Canada built 5 maf of non-Treaty storage in Mica.

BPA and BC Hydro are parties to the NTS Agreement to use this storage for power generation purposes. The NTSA essentially provides for daily and weekly fine-tuning of weekly / monthly Treaty operations.

The Corps monitors weekly Non-Treaty storage activity as it pertains to overall Canadian storage. We are not active in the use of the storage.

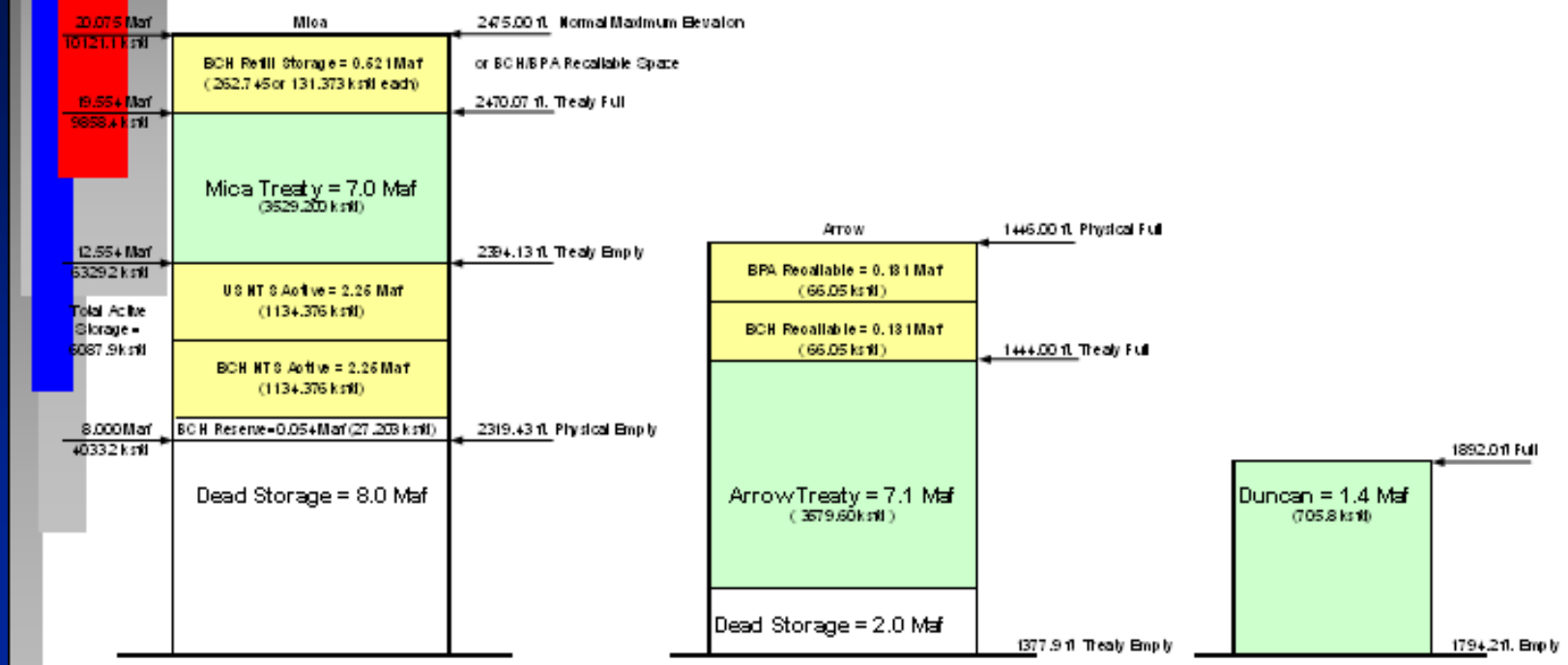
TREATY PROJECTS

	Completed	Treaty Storage	Non-Treaty Storage	Installed Capacity	Hydraulic Capacity
MICA	1973	7.0 MAF	5.0 MAF	1,805 MW	40 kcfs
ARROW	1968	7.1 MAF	.25 MAF	185 MW *	39 kcfs
DUNCAN	1967	1.4 MAF 15.5 MAF	None	None	10 kcfs
LIBBY	1973	- - - - -	5.0 MAF	604 MW	25 kcfs

* online date - Fall of 2001

Allocation of Treaty and Non-Treaty Reservoir Space

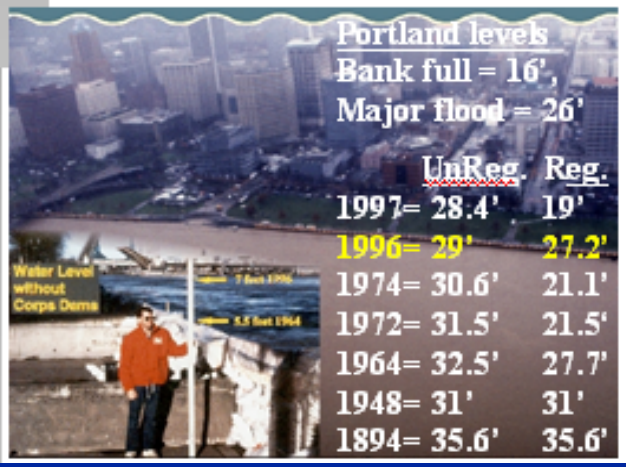
(not to scale)



Note: NTSA states that Mica Refill Storage = 0.521 Maf & 262.745 km³, so we use 262.745, even though 0.521 / 1.98347 1 = 262.671

Treaty Provisions for Flood Control

- 8.45 million acre feet (Maf) of storage at Arrow, Duncan, and Mica is assured for flood control operation.
- Additional 7 Maf of Treaty Storage and 5 Maf of Non-treaty storage available "on call" for large floods at cost of $1.875 million at each of the first four requests.
- $64,400,000 cash payment made to Canada by U.S. Government at the completion of the three Canadian projects for one-half of the estimated present worth of future flood damages prevented in the U.S.



- Corps or Engineers estimates that Treaty Storage prevented over $200 million ($1985) in 1972 and 1974.
- Treaty storage reduced 1997 peak flows at The Dalles by 170,000 cfs , and prevented about $197 million in flood damages.

Treaty Provisions for Hydropower

- 15 1/2 million acre feet of Canadian storage is operated for optimum power generation downstream in Canada and the US.
- Canada has Entitlement right to receive 1/2 of increased power generated downstream in the U.S. due to operation of Canadian Treaty storage.
- Power benefits from treaty storage are defined as dependable capacity and average annual usable energy.
- Downstream power benefits (DPB) resulting from Libby storage operation belong to the country where they are generated, ie U.S. or Canada.
- The hydroelectric operating plans provide a monthly reservoir balance relationship for the whole of Canadian storage, allowing Canada flexibility to operate individual projects for maximum Canadian benefit.

SUMMARY OF ACCOMPLISHMENTS

- **TREATY AND PROTOCOL: defined dams, operations, and benefit computations for Treaty Storage**
- **CANADA-BC AGREEMENT: gave construction & operation obligation, & benefits to British Columbia and allowed sale of Canadian Entitlement to US**
- **CANADIAN ENTITLEMENT: sold to Columbia Storage Power Exchange (CSPE) for $254 million for a period of 30 years following the completion of each project. BC used funds to construct their dams. (Next 30 years covered under Agreement on Disposal of Canadian Entitlements, signed March 1999)**
- **ALLOCATION AGREEMENTS: allocated Canadian Entitlement obligations among downstream US Columbia River project owners**
- **PACIFIC N.W. COORDINATION AGREEMENT: insured coordinated operation of US projects for optimum power to create Entitlement (1964 Agreement about to be replaced by 1997 Agreement)**
- **POWERHOUSE EXPANSION: on mainstem Columbia projects justified by increased fall-winter flows from Treaty storage operation and the US built the Grand Coulee Third Powerhouse**
- **PNW-PSW INTERTIE: justified by PNW power surplus resulting from US Entitlement and purchase of Canadian Entitlement**

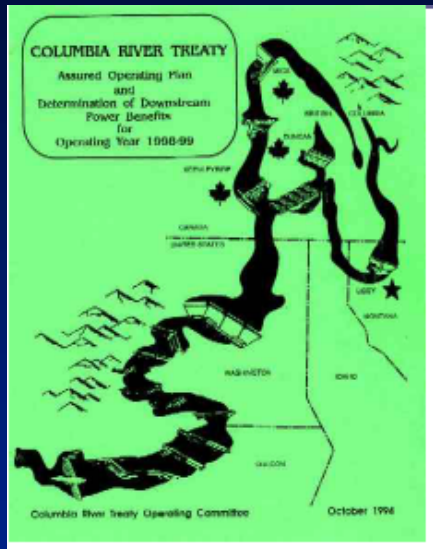
Columbia River Treaty Organization

* Established by TREATY ** Established by ENTITY *** Established by PEB

RESPONSIBILITIES OF THE US ENTITY

- The US and Canadian Entities meet once each year, usually with the Permanent Engineering Board, usually in February or March
- The Division Commander is responsible for flood control issues
- The BPA Administrator is responsible for the power issues
- The Entities sign Treaty plans, both the Assured Operating Plan and the Detailed Operating Plan

ASSURED OPERATING PLAN



Assured Operating Plan

- Treaty requires the Entities jointly develop each year an Assured Operating Plan (AOP) for Canadian Treaty storage for the sixth succeeding operating year from hydro-regulation studies designed to achieve optimum power and flood control benefits in Canada and U.S.
- Most modern non-power requirements (e.g. fish and recreation) CANNOT be included in the AOP according to Treaty's oversight body's (PEB) opinion.

Determination of Downstream Power Benefits (DDPB)

- The AOP operating criteria is used to determine how much added usable power is generated downstream in the U.S. as a result of Canadian Treaty operations. One-half (1/2) of that power is the Canadian Entitlement.
- Canadian Entitlement payments are NOT affected or adjusted to reflect actual (real) power benefits each year.
- Current Canadian Entitlement is 482.8 average annual MW, delivered at rates up to 1241 MW, as scheduled by the Canadian Entity. Value to B.C., evaluated at $60/MWh, is about US$ 254 million per year.

DETAILED OPERATING PLAN

Detailed Operating Plan

- Treaty allows the Entities to jointly prepare and implement Detailed Operating Plans (DOP) that "may produce results more advantageous to both countries" than from operation under the AOP.
- The Entities and PEB have agreed that more advantageous results may include objectives other than power and flood control, e.g. fish, recreation, and dust storm avoidance, etc.

- Past practice has been for the DOP to authorize the Operating Committee to further agree within an operating year to supplemental operating agreements with mutually beneficial changes from the AOP operating data and procedures to meet current power and nonpower objectives.
- Actual Treaty storage operations are scheduled on a weekly basis and measured by flow at the U.S./Canadian border. This allows the Canadians the option to modify individual reservoir operations so long as the flow at the border is the same.

SUPPLEMENTAL OPERATING AGREEMENTS

Use of Canadian Treaty storage for U.S. non-power objectives is limited by the need for mutual benefits, so an annual agreement is uncertain because of the need for a "win-win" solution for the current situation.

The annual Non-Power Uses Agreements between 1994 and 2007 have included 1 Maf storage for U.S. Biological Opinion Flow Augmentation and Vernita Bar minimum flows, while protecting Canadian Trout and White Fish and other Canadian non-power objectives.

Other SOA's have improved both power and non-power operations in both countries, e.g. fall storage.

The Entities anticipate developing similar non-power agreements for 2008 and beyond.

TREATY CHALLENGES

- Libby Coordination Agreement
- Biological Opinion request for 1 maf + other storage at Arrow
- Meeting Canadian fishery, recreation, & dust storm needs
- Long Term Strategy for Development of Assured Operating Plans
- Need for additional Canadian storage operation for U.S. fish
- Within month flexibility of Treaty storage operation
- Adopting VarQ Flood Control and Additional ESA listings (burbot)

PAST TREATY ISSUES

Only a few issues falling into two general categories:

I. Requests to operate Canadian storage for U.S. fishery objectives and the resulting power impacts

1984 request by U.S. Entity to include Water Budget minimum flows in the AOP led to Permanent Engineering Board conclusion that system wide nonpower operating objectives could NOT be included in the AOP, as it contradicts Treaty requirement for optimum power operation.

Feb. 2000 Libby Coordination Agreement resolved dispute on Canada's request for compensation for their Kootenay project power losses caused by Libby's operation for sturgeon and salmon, and the related dispute on failure to agree to AOP's. U.S. agreed to limit Libby's fishery operation in the AOP (not in actual operation), and BPA helps mitigate Canada's power losses with exchanges of provisional energy.

II. Calculation and delivery of the Canadian Entitlement

- 1993-99 discussions on delivery and disposition of the Canadian Entitlement after 4/1/98 was resolved by 11/96 Entity agreement that allowed Entitlement return at Blaine, WA. and near Nelway, BC; defined transmission energy losses at 3.4%; and established scheduling guidelines.

CURRENT TREATY ISSUES

US Biological Opinion objectives for storage in Canada for U.S. fishery needs.

Meeting Canadian water needs other than power and flood control

White fish, rainbow trout, sturgeon, recreation, navigation, agriculture impacts, and wetland preservation

Variable Q and Variable End-of-December adjustments to Libby flood control rule curves

Canadian Entity has requested compensation for their Kootenay plant power losses.

PNW states' interest in additional water for irrigation/consumptive uses

Firm transmission availability for the delivery of Entitlement power.

DISPUTE RESOLUTION

Unresolved differences may be referred by either party to the International Joint Commission (IJC) for decision.

If the IJC reaches no decision within 3 months (or any period agreed to by both parties), either party may submit difference to an arbitration Tribunal (1 member appointed by Canadian, 1 member appointed by the US, and 1 member (Chair) jointly appointed by Canada & the US). If no appointment is made with 6 weeks, the President of the International Court of Justice may be requested to make the appointment (s).

Decision is by majority, and ruling is definitive and binding.
Arbitration costs to be shared as agreed to by the parties.

Alternative procedures for settling difference may be allowed, if and when agreed by the two parties.

The PEB "assists in reconciling differences concerning technical or operational matters that may arise between the entities."

TREATY'S FUTURE

- Either country can terminate most of the provisions of the Treaty on or after September 2024, given minimum of ten years' advance notice, hence importance of decision in 2014

- Regardless of termination, the U.S. pre-paid purchase of annual flood control from Canadian Treaty storage ends in 2024

- Existing Treaty is focused only on flood control and hydropower; fishery, water supply and other interests need to be considered in evaluating the future of the Treaty

- Before 2014, extensive analysis and collaboration will be required to evaluate options and make a decision on whether to terminate, modify, or continue with the existing Treaty


Questions?